

large a portion of the mining machinery for our Colonies from our Transatlantic cousins.

It seems probable that liquid air, which can now be produced at a very cheap rate, will prove a most valuable auxiliary for cooling, and thus assist in ventilating mining drifts and railway tunnels. Experiments in this direction are being made in connection with the works of the Simplon Tunnel, which are now in full activity.

The problems now opening up to the civil engineer are of surpassing importance. Trunk railways through Russia, China, Persia, Africa; irrigation works to supply the wants of growing populations; harbours large enough to receive the vessels of the future (already eclipsing the *Great Eastern*, of which the chief shortcoming was that she was before her time); central installations to furnish lighting, power, traction and heating to whole countries; the extension of the telephonic communication—with and without wires; the abolition of the smoke and smell of cities; the replacement of horses by mechanical power in the streets; the increase of the speed of trains to 100 miles per hour; the erection of buildings of great height where land is valuable; the utilisation of waste products, especially the refuse of cities; the improvement of the water-supply; the reclamation of land; the profitable working of deep seams of coal.

These are but some of the branches in which engineering progress in the twentieth century may be expected to develop. They will call with increasing force for engineers sanguine for the future, educated upon a basis of sound scientific attainment, trained in experimental research, and qualified by practical experience—obtained, I trust, by means of that regular course of pupilage under members of the Institution which, in the less favourable circumstances of the past, has nevertheless produced the engineers who have achieved the results to which I have referred.

ANTHROPOLOGY AT THE BRITISH ASSOCIATION.

THE chief point of interest on the first day of the meeting of the Section, apart from the President's address, was a discussion on the rival systems for the identification of criminals of the Bertillon method and that based on finger-prints as propounded by Mr. E. R. Henry and adopted in British India. Mr. Henry, who is the Inspector-General of Police in the Bengal Civil Service, gave a demonstration of his system. The author referred to the importance of fixing human personality so that no efforts made to confuse it subsequently may prove avail. Of this problem the Bertillon system offered first scientific solution. But experience in India has shown that the "Personal Equation" error of measures predominates so much as to vitiate seriously the correctness of the recorded results under that system. Finger-prints, on the other hand, being absolute impressions taken from body under conditions which eliminate error in transcribing or recording, the "Personal Equation" error is reduced to a minimum. Taking the impressions of all ten digits occupies only a fraction of the time required for measuring, while search is more exhaustive and many times more rapid. This new system has been introduced on a most extensive scale throughout British India, and the Legislature has recognised it by passing an Act to amend the law of evidence so as to make relevant the testimony of finger-print experts.

The main difficulty hitherto experienced had been that of providing an effective system of classification. But this difficulty has been overcome. A thin film of printer's ink is spread over a piece of flat tin, and each finger in turn is pressed on the film, and after being thus inked is pressed on paper where a clear, sharp impression is left. Fingers are impressed in their natural order of thumb, index, middle, ring, and little, those of the right hand being above, and the corresponding digit of the left hand below them.

All impressions must be either arches, loops, whorls, or composites—there is a great preponderance of loops and whorls. In primary classification arches are included under loops, and composites under whorls, and therefore, for purposes of primary classification, an impression must be either a loop or whorl. The digits are taken in the following pairs: (1) right thumb and right index; (2) right middle and right ring; (3) right little and left thumb; (4) left index and left middle;

(5) left ring and left little finger. Taking first pair and denoting loop by L and whorl by W, we get the following arrangements. Right thumb may be L and right index L; right thumb may be L and right index W; right thumb may be W and right index L; and right thumb may be W and right index W. So there are four, and not more than four, arrangements possible. Similarly, in second pair, there are four such arrangements, which, taken with those of the first pair, yield 16 combinations; taking the third pair we get 64 combinations, and by adding the fourth and fifth pairs, this number rises to 256 and 1024. Now 1024 equals 32 squared; in other words, a cabinet containing 32 sets of 32 pigeon-holes arranged vertically would provide all the locations required. A diagram was shown how this works in practice. But the following rule is very simple. The first of each pair is shown as numerator, the second of each pair as denominator, yielding for the five sets of pairs some such formula as the following: $\frac{L}{W}; \frac{W}{L}; \frac{L}{W}; \frac{W}{L}$. A

whorl in the first pair counts 16, in the second pair 8, in the third 4, in the fourth 2, in the fifth 1. No numerical value is given to a loop. Substituting these values in the formula we get $\frac{1}{8}; \frac{8}{1}; \frac{1}{4}; \frac{2}{1}; \frac{1}{2} = \frac{1}{16}$. Add 1 to both numerator and denominator and invert the fraction which becomes $\frac{17}{16}$, and this is the primary classification number, and represents that the card containing these impressions will be found on the twentieth pigeon-hole of the eleventh vertical row. The secondary classification required to break up accumulations is equally simple, and the search formula or legend for each card can be prepared rapidly without any key and brings search down to groups of very small volume.

Naturally Dr. Garson argued in support of the French system as taught by him to the English police. He had previously read a paper on the "Personal equation in anthropometry," and had fully described the well-known Bertillon system; he admitted there was always a margin of uncertainty in measurements, but denied that it need be so large as Mr. Henry asserted. He expressed regret that the Indian Government had abandoned the Bertillon system for one based solely on finger-prints.

A paper, also illustrated by lantern slides, was read by Francis Galton on "Finger-prints of young children," in which he demonstrated that clear prints of all ten fingers of a baby would suffice for after-identification by an expert, but by an expert only. Although new ridges may appear in infantile life the type of each pattern persists all through life, and is never doubtful to a practised eye.

The whole of Friday was devoted to samples of the work accomplished by the Cambridge Expedition to Torres Straits and New Guinea. Dr. A. C. Haddon, the organiser and leader of the expedition, led off with a short report on the work done (*cf. NATURE* vol. ix. p. 413), and illustrated with lantern slides the physical character of the inhabitants. A communication on the linguistic results of the expedition, by Mr. Sidney H. Ray, was laid before the Section.

The language of the Eastern tribe of the Straits bears no resemblance to the Melanesian, and but little to the Australian group of languages, while that of the Western tribe is decidedly of the Australian type. Most of the coast languages of the Port Moresby and Hood Bay districts are very closely akin to the languages of the Melanesian Islands, except some, such as the Koitapu, Koiari and Cloudy Bay dialects, which approach the Australian type, but has nothing in common with the Melanesian. Mr. C. S. Myers gave an interesting paper on savage music, based on his observations in Murray Island and Sarawak.

As our modern orchestra admits the noises of drums and cymbals, and our harmony allows chords which in a more classical period were inadmissible, we, in our inquiry into past and primitive music will not refuse to consider certain sounds as musical even though they be noisy. Sympathy should be our sole test of music. In savage life the songs of a tribe are its chief heritage. Certain songs recorded on the phonograph in Murray Island, Torres Straits, are now obsolete, and will probably die out with the old men. Neither there nor in Borneo could any trace of the notes of birds be found in the music. Of the two fundamentally distinct elements in music, rhythm and melody, the one has its basis in bodily movement, the other in the emotional recitative. In Murray Island the drum is beaten to accentuate the words of the old songs, the music being singularly lacking in rhythm; among the North American Indians, on the other hand, rhythm is well developed. The

extraordinary complexity of rhythm in certain Malay music was graphically recorded. The Murray Islanders have a wonderfully developed idea of rhythm, as is proved by their being able regularly to continue accurately recorded beats of prescribed rapidity for a considerable period. Many suggestions have been made as to which of the intervals came most naturally to the human voice. The Murray Islanders have no polyphonic music, but in a chorus accompanying the songs of the Kenyah and allied races in Borneo a long-drawn note a fifth below the keynote runs drone-like through the song. A similar interval has been noted in one of the rare examples of polyphonic music found in North America.

Writers have led to conclude that various peoples employed far smaller intervals than our own, misled apparently by viewing the numerous intervals as if they formed a scale instead of a series of notes from which various scales were derived. In this way travellers have been induced to look for quarter-tone music in uncivilised parts of the world; but the author had no doubt that those quarter-tones, which have been written down as occurring between any two whole (or semi-) tones, merely express a gradual descent in the voice from one of these tones to the other. The insensitivity of the ear of the Murray islanders to minute differences of interval was estimated by means of tuning-forks. The common incorrect intonation in savage music was alluded to.

Mr. C. G. Seligmann followed with an account of the seclusion of girls at puberty in Mabuiag and other of the Western islands of Torres Straits and also on the mainland at Cape York. The girl is surrounded with bushes in a dark corner of her parents' house, and for months is only allowed to go out at night. The sun may not shine on her; no man may come into the house; ill-luck would befall her father if he saw her; she may not feed herself; and there are other restrictions. Various modifications of the seclusion were described. These observations are of especial interest, as it is a new locality for these interesting customs, the significance of which have been discussed by Frazer in "The Golden Bough." The same author read a paper on some customs of the Otati tribe of North Queensland; and another, illustrated with lantern slides, on the Club Houses and Dubus of British New Guinea. In the Papuan Gulf the club houses of the men are of large size and highly decorated; no women may enter them. Further down the coast their place is taken by platforms, or dubus, the posts of which are generally carved, in some instances probably so as to resemble crocodiles' heads. As a general rule women may not approach the dubu.

The morning's session concluded with a very interesting report on the investigations on comparative psychology made in Torres Straits and New Guinea. Dr. W. H. R. Rivers gave a general account of the work done, with observations on vision, &c. The natives show very considerable variability in character and temperament; they do not appear to be especially susceptible to suggestion, but exhibited very considerable independence of opinion. One hundred and fifty natives of Torres Straits and Kiwai were tested for colour-blindness without finding one case; about eighty members of other races were tested with a similar result, but of eight Lifu islanders three were colour-blind. The names used for colours by the Torres Straits islanders were very fully investigated; there were definite names for red, less definite for yellow, and still less so for green, while a definite name for blue was either absent or borrowed from English. Corresponding to this defect of colour terminology, there appeared to be an actual defect of vision for colours of short wave-length. Numerous observations were made on writing and drawing; the most striking result was the care and correctness with which mirror writing was performed. Unexpected success attended the experiments on the estimation of time. Nearly all the investigations gave some indication of the liability to fatigue and the capability for improvement by practice. Mr. C. S. Myers gave an account of his observations on hearing, smell, taste, reaction-time, &c. Few Murray Islanders surpass a hyper-acute European in auditory acuity, while the majority cannot hear as far. The sense of rhythm is remarkably accurate. There is no reason to believe that they are able to perceive such traces of odour as would be imperceptible to the most sensitive European noses. Experiments were made to determine the appreciation and recognition of the common tastes. The time of simple reaction is probably somewhat shorter than would be that given by a corresponding class of Europeans. The observations of Mr. W. McDougall on the sense of touch

showed that the natives have a greater delicacy of discrimination than white men, and at the same time less sensibility to pain.

In the afternoon Dr. Haddon gave a lantern exhibit that lasted for a couple of hours; over one hundred slides were shown, illustrating native handicrafts, customs and mode of life. A number of sacred stones and spots were shown, and their legends narrated. A series of sixteen slides fully illustrated the process of pottery-making at Port Moresby; other slides showed men cutting out canoes with stone adzes at Keapara; raising a pile, and the process of tattooing at Bulaa; and a number of beautiful photographs portrayed the singing games of Papuan children. Most of the photographs exhibited were taken by Mr. A. Wilkin.

Saturday was devoted to archaeological papers, and several members of the French Association were present at the session. The most important communications were: one by Mr. A. J. Evans on the occurrence of "Celtic" types of Fibula of the Hallstatt and La Tène periods in Tunisia and Eastern Algeria; the appearance of Celtic types of Fibula among the Numidians finds its complement in the discovery of large hoards of Carthaginian and Numidian coins on the transit line of the amber trade between the Save and the Adriatic. The other, by Mr. G. Coffey, on Irish copper Celts; of these there are eighty-two examples in the Dublin Museum; they are found all over Ireland, and appear to represent a transition from stone to bronze types, and can be arranged in series showing development of form from stone to bronze implements. It would thus appear that, prior to a knowledge of bronze, copper was known and used for cutting implements in Ireland.

Physical anthropology was represented on Monday morning. Mr. J. Gray read a paper, with lantern illustrations, on recent and most excellent ethnographical work in East Aberdeenshire, based on observations on nearly 14,000 children. The maps showed very clearly the penetration up the valleys of an immigrant fair type among a dark population. A very valuable paper, also illustrated by numerous lantern slides, was read by Mr. D. MacIver on recent anthropometrical work in Egypt.

The author gave examples of the ways in which anthropometry may aid archaeological investigation, and pointed out the unusually favourable conditions for such anthropometrical work which exist in Egypt. He gave a summary of the series of Egyptian measurements at present available, of the difficulties which have arisen in their interpretation, and of some new methods of publishing measurements specially designed to meet them; these graphic methods were suggested by Flinders-Petrie, and will doubtless prove of value to other investigators.

Details were given of three important series of specimens from Egypt, viz. :

- (1) Prehistoric Series; from the excavations of 1898-9.
- (2) VI. to XII. Dynasties; from the excavations of 1898.
- (3) XII. to XVI. or XVII. Dynasties; from the excavations of 1898-9.

These series were considered (*a*) separately, with the object of ascertaining the race type represented in each; (*b*) in comparison with one another, to show their affinities and differences. The paper concluded with a most instructive and suggestive essay on the light which such comparison throws on Egyptian history.

Prof. A. Macalister followed with notes on a collection of 1000 Egyptian skulls, and exhibited curves compiled from the indices.

In the afternoon Prof. W. M. Flinders-Petrie read a paper on sequences of prehistoric remains. In written history the value of chronology lies almost entirely in its defining the sequence of events; and if the order of changes in a civilisation can be fixed, the reference to a scale of years is but a secondary matter. Hitherto only very vague and general terms, referring to places and not to age, have been used in naming prehistoric remains. But if we possessed a perfect record of an unlimited number of contemporary groups of objects all of which have had a time of invention, popularity, and decay, and the use of which overlap each other, it is clear that with patience it would be possible to arrange all the series of groups in their order of time, and so establish definite sequences among the various objects. If then a sequence can be established, a scale of notation is needed. As a scale of years is impossible, a scale of equal activities is the most reasonable. This may be reached by placing all the available material in order and then dividing it into a scale of equal parts. Such a scale, though not equal in time, will yet give a fair unit for measuring a civilisation. This

Prof. Flinders-Petrie has accomplished for prehistoric Egypt, and his demonstration indicated that his system is an important addition to precision in dealing with undateable archaeological remains. A second paper by the same indefatigable and brilliant investigator dealt with early Mediterranean signaries and the sources of the alphabet.

The large series of signs used in Egypt about 2500 B.C. is now shown—by such signs existing as far back as 5000 B.C.—to be independent of the hieroglyphic system or any derivatives of that. Similar signs in Crete show this system to have extended to the Mediterranean by about 2000 B.C.

On looking at the more extended forms of the Greek alphabet found in Karia and Spain, about sixty signs are seen in use, representing about forty-three sounds. Three-quarters of these signs are common to the system found in Egypt and Crete.

The only conclusion at present seems to be that signs were in use from 5000 B.C. onward, and developed by 2500 B.C. to over 100 in Egypt, of which half survived in the fuller alphabets of Karia and Spain. The compression and systematising of these signs was due to twenty-seven of them being adopted for a numerical system by the Phoenicians, and thus the *alpha beta* order was enforced by commerce on all the Mediterranean. This accounts in the only satisfactory way for the confusion of the early Greek alphabets, and is a view forced on us by the prevalence of these same signs long before Phoenician commerce.

On Tuesday Dr. A. C. Haddon read some notes on the Yaraikanna Tribe of Cape York:—

The Yaraikanna are fairly typical Australians in appearance; six men were measured, average height 1'625 m. (5 ft. 4 in.), cephalic index 74·7 (extremes, 72·4-77·7). A lad is initiated by his *mawara*, apparently the men of the clan into which the boy must subsequently marry; he is anointed with "bush-medicine" in the hollow of the thighs, groins, hollow by the clavicles, temples, and back of knees to make him grow—the bull-roarer is swung. In the *Yampa* ceremony the initiates (*langa*) sit behind a screen in front of which is a tall pole, up which a man climbs and catches the food thrown to him by the relatives of the *langa*. Then the bull-roarer is swung and shown to the *langa*; lastly, a front tooth of the *langa* is knocked out, with each blow the name of a "land" belonging to the boy's mother or of her father is mentioned, and the land, the name of which is mentioned when the tooth flies out, is the territory of the lad. Water is next given to the boy, who rinses out his mouth and gently empties his mouth into a palm-leaf water vessel; the clot by its resemblance to some animal or vegetable form determines the *ari* of the lad. The *ari* appears to be analogous to the *manitu* or *okki* (or "individual totem" of Dr. J. G. Frazer) of the North American Indians. After the ceremony the boy is acknowledged to be a man. Other *ari* may be given at any time by men who dream of an animal or plant, which is the *ari* of the first person they meet on awakening. The *Okara* ceremony was alluded to, and various customs, among which may be noted—children must take the "land" or "country" of their mother, a wife must be taken from another country, all who belong to the same place are brothers and sisters.

Mr. W. Crooke discussed the primitive rights of disposal of the dead, as illustrated by survivals in modern India; the points considered were: customs connected with the preservation of the corpse, such as various forms of mummification; platform burial; direct exposure of the dead to beasts of prey; general exposure of the dead; the question of the priority of burial to cremation; transitions from burial to cremation, and vice versa; disposal of those dying in a state of taboo; shelf or niche burial; crouched or sitting burial; disinterment of the corpse; jar or urn burial; and dismemberment of the corpse.

A theoretical paper on pre-animistic religion was read by Mr. R. R. Marett, his general thesis being:—

The term religion denotes a state of mind embracing emotional and ideal constituents, whereof the former constitute the universal and constant, the latter the particular and variant element. Self-interpretation in ideal terms on the part of the religious emotion of the savage has found most complete and definite expression in animism, the "belief in spiritual beings." Animism, however, as compared with "supernaturalism," namely, that state of feeling almost uncoloured by ideas which is the primary form taken by man's awe of the supernatural (or extraordinary) is but as the strongest sapling in a thicket of heterogeneous growths, which, in the struggle for existence, has come to overshadow the rest and give a character

to the whole. The vagueness of primitive "supernaturalistic" utterance is illustrated by, e.g. *andriamanitra* (Malagasy), *ngai* (Masai), *mana* (Melanesians), *wakan* (North American Indians), *kalou* (Fijians). A "pre-animistic" validity as manifestations of religion thus attaches to a variety of special observances and cults; and it may therefore be interesting in the case of some of the more important of these to distinguish between the original basis of "supernaturalistic" veneration and the animistic interpretation that as the result of successful competition with other modes of explanatory conception (notably "animatism," namely, the attribution of life and will, but not of soul or spirit, to material objects and forces) is thereon superimposed in accordance with the tendency of the religious consciousness towards doctrinal uniformity.

In the afternoon Colonel R. C. Temple discoursed on the thirty-seven Nats (or Spirits) of the Burmese.

The belief in the Nats, or supernatural beings who interfere in the affairs of mankind, is universal among all the native inhabitants of Burma of every race and religion. Every writer about the Burmese and their customs mentions the Nats. The subject is, however, still but vaguely understood. The Nats are of three distinct kinds: (1) the supernatural beings due to the Buddhist cosmogony; (2) the supernatural beings familiar to the creatures, objects and places with which man is concerned due to the prehistoric animistic beliefs of the people; (3) the supernatural beings who are ghosts and spirits of the notorious dead. Of the many orders of Nats thus created, that of the Thirty-seven Nats is by far the best known among the people. These are the ghosts of the departed royalties of fame, and their connections. About them nothing seems to have been previously published in England, and this paper was a preliminary attempt at an adequate representation of them, and of the history, real or supposed, connected with them during life. The paper was illustrated by a map in order to explain the relative position of the places chiefly connected with the very complicated political history of Burma and its numerous dynasties, so far as these are concerned with the stories related of the Thirty-seven Nats. The paper was further illustrated by a beautiful lantern slide of an image of each of the Thirty-seven Nats from the unique and authentic collection of large carvings of them in teak wood by Burmese artists in the possession of the author.

The most important communication on Wednesday morning was a description of two new methods of anthropological research by Dr. W. H. R. Rivers. He commenced by emphasising the importance of great accuracy in all anthropological investigations. His first exhibit was a contribution to exactitude in recording colours, more especially those of the skin of natives. Lovibond's tintometer proved of great service in matching colours, but it is not very suitable for matching skin-colours; for this a colour-wheel is most suitable, the only objection being that the paper discs are liable to fade, and it is not always certain that any two issues of coloured discs would be of exactly the same tint. By having a large number of discs the original records could be filed for future reference and, if kept in the dark, they would not fade. If permanent and absolutely comparable discs could be produced the colour-wheel would answer all practical purposes. The second was a most important sociological method, and consisted in accurately recording the genealogies of all the individuals of an island or limited community for as far back as the informants can remember. It is necessary to use only the terms of "father," "mother," "wife," "children," "man," "woman," "boy" and "girl." The first two were qualified by "proper" or "true," so as to avoid ambiguity. By asking what A calls B, &c., the names and system of relationship can be obtained with absolute precision. In a totemistic people their totems were also recorded, which yielded evidence as to marriage restrictions. This method also furnishes definite statistics on the size of families, proportion of sexes, number of early deaths, prevalence of adoption, and various other sociological data which are very difficult to obtain with accuracy by any other method. This method of Dr. Rivers' should be adopted by all investigators, as it is almost impossible to overrate its value.

The rest of the day was devoted to African ethnography. Dr. R. Koettlitz exhibited some interesting ethnographical specimens from Somali, Galla and Shangalla, including some scales and weights of seeds and stones for weighing gold-dust, and the first example of salt-money that has been brought to England. Papers by Lieut.-Colonel J. R. L. Macdonald on the ethnography of the lake region of Uganda, and by Lieut.

H. Pope Hennessy on notes on some West African tribes north of the Benue, were laid before the Section.

The usual reports of various Committees were read at various times, the most voluminous being that of the Ethnographic Survey of Canada. It stated that during the past year the work of the Committee had been extended in important directions. The introduction into the North-west of large bodies of Europeans who were to become permanently incorporated in the population suggested the importance of securing as soon as possible such facts relating to their general ethnology as might seem to establish a suitable basis for the study of these people under the influence of their new environment. Satisfactory arrangements had been made with respect to Russian refugees known as the Doukobohors, and it was probable that similar arrangements might be completed during the coming year with regard to other large bodies of immigrants. The exceptional circumstances in British Columbia, the fact that it was becoming more difficult each year to obtain trustworthy accounts of its people, the rapid disappearance of old customs, dress, and modes of living had seemed sufficient reasons for devoting to their study a much larger share of the resources of the Committee than might otherwise appear justifiable. An appendix contained an account of early Canadian settlers and studies of the Indians of British Columbia. On the whole Section H may be congratulated on the very uniform high excellence of the papers, it probably being one of the very best meetings that the Section has ever had.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—A meeting of the Junior Scientific Club was held in the University Museum on Wednesday, November 1. After private business, Mr. F. C. Lees (Hertford) read a very interesting paper on geysers in action, exhibiting also an excellent working model. A brisk discussion afterwards ensued.—Mr. Gibson (Ch. Ch.) also read his paper on the retention of plant-food in the soil, which had been postponed from the previous meeting.

CAMBRIDGE.—At the annual election on November 6, at St. John's College, the following were elected Fellows: Mr. W. A. Houston, fifth Wrangler 1896 and Smith's Prizeman 1898, Lecturer in Mathematics at University College, Liverpool; Grafton Elliot-Smith, B.A. 1898, M.D. of the University of Sydney. Dr. Elliot-Smith, who entered the University in 1896 as an Advanced Student, has made a number of highly important contributions to the comparative anatomy of the brain, and is one of the assistant-demonstrators of anatomy under Prof. Macalister.

The Council of the Senate propose that, having regard to the extensive and valuable collections procured for the University by the Torres Straits Expedition, a further grant of 100*l.* (making 550*l.* in all) be made from the Worts Travelling Scholars' Fund to Dr. Haddon towards the expenses of the expedition.

Mr. C. Hose, of Borneo, has presented to the Museum of Zoology a fine example of the ourang outan's nest. A collection of skeletons and skulls of the extinct Moriori race, which formerly inhabited the Chatham Islands, has been acquired for the Museum of Anatomy.

Mr. Timothy Holmes has been added to the Medical School Buildings Syndicate. It is understood that the plans for the buildings are in a forward state of preparation.

Mr. F. W. B. Frankland, third Wrangler in 1897, has been elected to a Fellowship at Clare College.

MR. HORACE PLUNKETT, M.P., has been appointed vice-president of the new department of Agriculture and Technical Education for Ireland.

THE educational movement in Wales has afforded an exceptional opportunity of bringing the Principality into the front rank in the matter of scientific education, and it cannot fail to be a matter of regret to well-wishers of the movement to notice indications that the "modern side" of education is not developing to the same extent in Wales as in other countries. In the recent scholarship examination at the University College of North Wales only six science candidates presented themselves, of whom three were not Welsh, while twenty-five candidates intending to qualify in arts entered.

AMONG other agencies by which the Technical Education Committee of the Essex County Council is cultivating scientific knowledge is the County School of Horticulture at Chelmsford, the prospectus of which is before us. The aim of the School is to impart sound elementary instruction in the best methods of cultural treatment, based upon a knowledge of the structure and physiology of plants. The garden attached to the School covers an area of three acres, and is entirely devoted to educational uses. Horticultural and botanical students in Essex are fortunate in possessing an institution in which wisely planned courses of work upon plants can be followed under such good conditions as are available at Chelmsford.

THE purposes for which the Technical Education grant is used in the various counties are shown concisely in a document just published by the County Councils Association. The counties are arranged alphabetically, and under each is given information concerning the work done in regard to (a) schools of science and art, (b) technical institutes, (c) agricultural schools and institutes, (d) domestic economy schools and institutes, (e) day or other schools or classes giving instruction in agricultural, commercial, domestic, manual or technological subjects. The Returns (which refer to 1897-98) also show the number of scholarships and exhibitions given by each County Council, and the provision made for examination and inspection of classes.

REPORTS received from time to time, referring to the work carried on under the auspices of Technical Education Committees of County Councils, show that in many agricultural counties the committees are gradually building up a system of teaching and experiment which serves much the same purpose as the educational branches of the agricultural experiment stations in the United States and elsewhere. In Somerset, for instance, the committee, of which Mr. C. H. Bothamley is the director, have organised courses of instruction in most branches of agricultural work; and the instructors not only lecture, but visit farms, gardens and orchards for the purpose of giving information and advice, for which no fees are charged, on points, both general and special, arising in agricultural practice, such as the manuring of arable and grass land, the treatment of wireworm, farm buildings, water supply, and similar matters. On one farm the failure of the mangold crop for the second year in succession was found to be due to an attack of large numbers of a very minute beetle, which Miss Ormerod identified as what is known as the pigmy mangold beetle, an insect which rarely occurs in sufficient numbers to be injurious, and which was in fact first recognised in this country in 1896. It is satisfactory to read that information has been given by several farmers to whom previous visits have been paid, to the effect that favourable results have followed the adoption of the methods suggested by the county instructor. A scheme for the establishment of an experimental farm has been drawn up, and will be put into effect as soon as the Secondary Education Bill is passed. School gardens are already carried on at several places in the county, and with much success. In other sciences, as in agriculture, the Somerset Education Committee appear to be proceeding on the right lines, and good results must attend efforts so wisely directed.

THE U.S. *Experiment Station Record* gives information concerning an extensive system of agricultural education which the Government of Russia is organising. The scheme provides for (1) higher education, furnished by independent agricultural institutes situated in the chief agricultural zones of Russia, and by chairs of agriculture and allied sciences in the universities; (2) agricultural high schools, which are in the nature of technical schools, and schools with courses in agriculture; (3) lower agricultural schools; and (4) the diffusion of general agricultural information. The schools for the so called lower education include (a) secondary agricultural schools, (b) primary agricultural schools, (c) agricultural classes, and (d) practical agricultural courses. These lower schools are to be under the jurisdiction of the minister of agricultural and imperial domains. They are to be maintained at the expense of municipalities, local communities, associations, &c., but may receive a part of their support from the Government. The secondary schools are to be established on Government land, or land donated for that purpose. The other lower agricultural schools may be established on private estates. The secondary schools are open to young men of all conditions who have completed the course in the primary public schools. The diffusion of general agricultural information is to be provided for by the organisation